

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
19 April 2001 (19.04.2001)

PCT

(10) International Publication Number  
**WO 01/27431 A1**

(51) International Patent Classification<sup>7</sup>: **E06B 9/264,**  
H02K 7/14, 5/12, 37/12

(21) International Application Number: **PCT/EP00/09959**

(22) International Filing Date: 10 October 2000 (10.10.2000)

(25) Filing Language: **English**

(26) Publication Language: **English**

(30) Priority Data:  
PD99A000225 13 October 1999 (13.10.1999) **IT**

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(81) Designated States (national): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ,  
DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR,  
HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR,  
LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ,  
NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM,  
TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

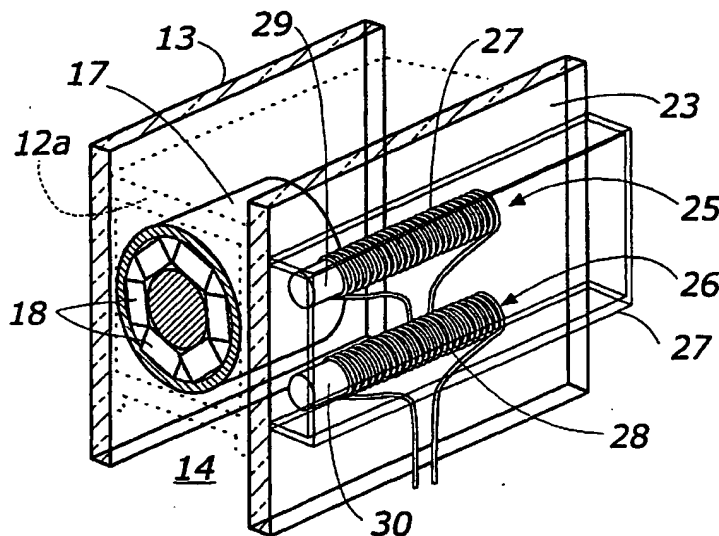
(84) Designated States (regional): ARIPO patent (GH, GM,  
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian  
patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European  
patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,  
IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG,  
CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: **ACTUATION ASSEMBLY FOR VENETIAN BLINDS OR THE LIKE INSIDE DOUBLE-GLAZING UNITS**



(57) Abstract: An actuation assembly (10), particularly for double-glazing units (11) with a perimetric frame (12) which supports two glass panes (13) which form, between them, a sealed air space (14) which accommodates light blocking means (15) which are adapted to be orientated and/or moved from a fully packed or rolled-up condition to unfolded conditions and vice versa. The assembly comprises a rotor (17) which is arranged between the panes, is connected so as to rotate together with an actuation shaft (20) of the light blocking means, and is provided with one or more permanent magnets (18) which are arranged with alternating polarities, and at least two electromagnets (25, 26) which are arranged so that when they are crossed by an electric current they generate respective magnetic fields whose polarities can vary according to the direction of the current and are arranged on corresponding angular positions with respect to said rotor.

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## ACTUATION ASSEMBLY FOR VENETIAN BLINDS OR THE LIKE INSIDE DOUBLE-GLAZING UNITS

### Technical Field

The present invention relates to an actuation assembly particularly for  
5 double-glazing units.

### Background Art

It is known that double-glazing units are currently particularly  
appreciated due to their functional characteristics of thermal insulation and  
soundproofing.

10 In particular, double-glazing units are door and window units of the type  
comprising a perimetric frame which supports two parallel panes which are  
at least partly transparent to light and form, between them, a sealed air space  
which accommodates light blocking means (Venetian blinds, pleated  
curtains or the like) moved by motor means from a fully packed or rolled-up  
15 condition to an unfolded condition which provides said blocking and vice  
versa.

One of the main problems of these double-glazing units is transmitting  
the motion of the motor means to the kinematic systems for moving the  
blocking means without compromising the hermetic seal of the frame of the  
20 double-glazing unit.

For this purpose, magnetic couplings have been conceived which are  
arranged partly inside the double-glazing unit and partly outside it and are  
substantially constituted by two facing shaft segments which support  
mushroom-shaped expansions constituted by circular permanent magnets.

25 In particular, the internal and external magnets face each other during  
use, so as to close axial lines of a magnetic field.

Automatically-actuated external magnets are associated with electric  
garmotors and are accommodated with them in box-like structures which  
are applied to the double-glazing units in various manners.

30 Although the magnetic couplings solve the problem of hermetic sealing,

they are not free from drawbacks.

First of all, it is known that the force transmitted by the magnetic couplings varies according to the facing surface, which is proportional to the closed field lines; accordingly, in this regard it is evident that in order to  
5 increase the force that can be transmitted by the coupling it is necessary to provide magnets having larger radial dimensions.

However, the seats for accommodating the magnets cannot easily withstand radial size increases, since they lie predominantly longitudinally.

An assembly has recently been devised which comprises a magnetic  
10 device for kinematic connection between an electric motor and the kinematic systems for moving the blocking means.

The assembly is composed of a ring of first permanent magnets, which is connected so as to rotate together with the actuation axis of the blocking means, and a ring of second permanent magnets having a pole orientation  
15 which is parallel and identical to that of the first ring; said second ring is adapted to turn in relation to the rotation of the first ring due to the closure of radial field lines.

The two rings can be coaxial, one inside the other, or parallel to each other.

20 In the first case, the motor is arranged between the panes but is encapsulated in a box-like structure which makes it removable and separate from the atmosphere inside the double-glazing unit.

Although this first case is a considerable improvement in terms of reducing space occupation, it does not allow controlled stepwise rotation of  
25 the motor and therefore it is difficult to provide fine adjustment of the orientation of the laminas if the blocking means is a Venetian blind.

This shortcoming is in any case also present in the magnetic couplings associated with motor drives described earlier.

In the second case, one of the two rings of magnets is internal and the  
30 other one is external, i.e., one of the panes is interposed between them, and

the motor is coupled to the external one.

Also in this case, stepwise adjustment of rotation is not possible.

Disclosure of the invention

The aim of the present invention is to provide an actuation assembly for  
5 Venetian blinds or the like in double-glazing units which is balanced from a  
mechanical standpoint and allows stepwise rotation of the shaft that  
supports the blind.

Within the scope of this aim, an object of the present invention is to  
provide an actuation assembly which is compact.

10 Another object of the present invention is to provide an actuation  
assembly which has a smaller number of components than conventional  
assemblies.

Another object of the present invention is to provide an actuation  
assembly which is particularly adaptable to various double-glazing units.

15 Another object of the present invention is to provide an actuation  
assembly which is reliable and ensures a long operating life.

Another object of the present invention is to provide an actuation  
assembly which can be manufactured with known technologies.

This aim and these and other objects which will become better apparent  
20 hereinafter are achieved by an actuation assembly, particularly for double-  
glazing units with a perimetric frame which supports two glass panes which  
form, between them, a sealed air space which accommodates light blocking  
means adapted to be orientated and/or moved from a fully packed or rolled-  
up condition to unfolded conditions and vice versa, characterized in that it  
25 comprises a rotor which is arranged between said panes, is connected so as  
to rotate together with an actuation shaft of said light blocking means, and is  
provided with a plurality of permanent magnets which are arranged with  
alternating polarities, and at least two electromagnets which are arranged so  
that when they are crossed by electric current they generate respective  
30 magnetic fields whose polarities can vary according to the direction of the

current and are arranged on corresponding angular positions with respect to said rotor.

#### Brief description of the drawings

Further characteristics and advantages of the present invention will become better apparent from the following detailed description of two embodiments thereof and of corresponding variations, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a schematic front view of a double-glazing unit provided with an assembly according to the present invention;

Figure 2 is an enlarged-scale sectional view, taken along a longitudinal plane, of a detail of the assembly of Figure 1;

Figure 3 is a perspective view, with parts shown in phantom lines, of the assembly of Figure 1;

Figure 4 is a sectional view, taken along a transverse plane, of the assembly of Figure 1;

Figure 5 is a sectional view, taken along a longitudinal plane, of the assembly of Figure 1, comprising a motion reduction unit;

Figure 6 is a view of part of the side of the Venetian blind inserted in the double-glazing unit of Figure 1 with the orientation cords.

#### Ways to carrying out the invention

With particular reference to Figures 1 to 6, a double-glazing unit provided with an actuation assembly 10 according to the invention is generally designated by the reference numeral 11.

The double-glazing unit 11 comprises a perimetric frame 12 which supports, in this case, two parallel glass panes 13 which form, between them, an air space 14 which is sealed by means of a perimetric seal 14a provided by means of silicone and which accommodates light blocking means which in this case are constituted by a Venetian blind, generally designated by the reference numeral 15.

The blind 15 is moved from a fully packed condition to an unfolded

condition and vice versa.

Part of the assembly 10 is accommodated in a shaped hollow element 12a which replaces a corner region of the frame 12 and comprises, in this embodiment, a rotor 17 with a plurality of magnets 18 arranged with  
5 alternating radial polarities.

As an alternative, the polarities can also be arranged axially.

The shaped hollow element 12a, which in practice lies between the two glass panes 13, can conveniently separate the components that it contains from the atmosphere inside the double-glazing unit 11, and conveniently its  
10 interior may be accessed through an opening 12b provided at the edge of the double-glazing unit 11 and closed by a removable cover 12c.

The rotor 17 is axially connected to a multiple-stage epicyclic reduction unit 19 and is supported, together with said unit, by a shaft 20 whose ends are freely supported in corresponding seats 21 and 22, of which one belongs  
15 to the structure of the hollow element 12a and one belongs to a hollow shaft 23.

The last stage of the reduction unit 19 is rigidly coupled to the hollow shaft 23 which winds the cords 24, from which the lower end of the Venetian blind 15 is suspended, and the cords 31 for orientating the slats 32.

20 According to the invention, the unit 10 also comprises two electromagnets, designated by the reference numerals 25 and 26 respectively, which in this case lie outside the double-glazing unit 11 and are accommodated in a box-like structure 27 on the outer face of one of the panes.

25 The two electromagnets 25 and 26 are each composed of a winding 27 and 28 and of a ferromagnetic core 29 and 30, and are arranged so that when they are crossed by an electric current they generate respective magnetic fields with polarities which can vary according to the direction of the current and are arranged in corresponding angular positions radially with  
30 respect to said rotor 17 (or, as an alternative, axially).

In practice, by generating at the ends of the cores 29 and 30 of the electromagnets 25 and 26 an alternation of positive and negative polarities which attract or repel the corresponding mutually close polarities of the rotor 17, a rotation of said rotor is produced.

- 5       The speed depends on the frequency of the alternations and the angle of each partial rotation depends on the angle between two consecutive magnets 18 of the rotor 17 with respect to the rotation axis and on the angle formed between the two electromagnets 25 and 26 with respect to said axis.

Each alternation of current corresponds to a single partial rotation, and  
10       therefore a stepwise rotation of the rotor 17 is obtained which can be controlled at will and it is possible to adjust the number of turns chosen for the lowering or lifting of the blind 15 and to adjust the inclination of the slats with a precision which depends on the angle of each individual partial rotation and on the reduction ratio of the reduction unit 19.

- 15       In practice it has been observed that the present invention has achieved the intended aim and objects.

In particular, it should be noted that stepwise rotation of the shaft that supports the blind with a compact actuation assembly has been made possible.

- 20       Moreover, the actuation assembly has a smaller number of components than conventional assemblies, since in practice it does not have the electric actuation motor (which is replaced by the pair of electromagnets).

The reduced number of components is further beneficial to reliability and durability in operation.

- 25       The present invention is susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept.

Thus, for example, the two electromagnets can also be arranged inside the space between the panes and can also be accommodated in a box-like structure which is fixed at its end to the rim of said double-glazing unit (in  
30       an upward region or laterally).

The details can be replaced with other technically equivalent elements, and the materials and the dimensions may be any according to requirements.

The disclosures in Italian Patent Application No. PD99A000225 from which this application claims priority are incorporated herein by reference.



CLAIMS

1. An actuation assembly particularly for double-glazing units with a perimetric frame which supports two glass panes which form, between them, a sealed air space which accommodates light blocking means which are adapted to be orientated and/or moved from a fully packed or rolled-up condition to unfolded conditions and vice versa, characterized in that it comprises a rotor which is arranged between said panes, is connected so as to rotate together with an actuation shaft of said light blocking means, and is provided with one or more permanent magnets which are arranged with alternating polarities, and at least two electromagnets which are arranged so that when they are crossed by an electric current they generate respective magnetic fields whose polarities can vary according to the direction of the current and are arranged on corresponding angular positions with respect to said rotor.
2. The assembly according to claim 1, characterized in that said one or more permanent magnets are arranged with radial polarities.
3. The assembly according to claim 1, characterized in that said one or more permanent magnets are arranged with axial polarities.
4. The assembly according to claim 1, characterized in that said at least two electromagnets are arranged with radial polarities.
5. The assembly according to claim 1, characterized in that said at least two electromagnets are arranged with axial polarities.
6. The assembly according to claim 1, characterized in that said two electromagnets are external to said double-glazing unit.
7. The assembly according to claim 1, characterized in that said two electromagnets are arranged inside the space between the panes of said double-glazing unit.
8. The assembly according to claim 1, characterized in that said rotor is axially connected to a reduction unit.
9. The assembly according to claim 8, characterized in that said reduction

unit is a multiple-stage epicyclic reduction unit.

10. The assembly according to claim 8, characterized in that said rotor and said reduction unit are contained in a shaped hollow element which replaces a corner portion of said perimetric frame.

5 11. The assembly according to claim 8, characterized in that said rotor and said reduction unit are supported by a shaft having ends supported in corresponding seats of said hollow element.

12. The assembly according to claim 8, characterized in that said reduction unit is kinematically connected to a shaft which winds cords from  
10 which a lower end of a Venetian blind is suspended, said blind constituting said light blocking means.

13. The assembly according to claim 8, characterized in that said reduction unit is kinematically connected to a shaft to which orientation cords of slats of a Venetian blind are fixed.

15 14. The assembly according to claim 1, characterized in that said two electromagnets are accommodated in a box-like structure which is fixed to an outer face of one of the panes.

15. The assembly according to claim 1, characterized in that said two electromagnets are accommodated in a box-like structure which is fixed at  
20 one end to a rim of said double-glazing unit.

16. The assembly according to claim 10, characterized in that said shaped hollow element separates components of said assembly contained thereinto from the atmosphere inside the double-glazing unit and wherein an opening is located at a rim of said double-glazing unit.

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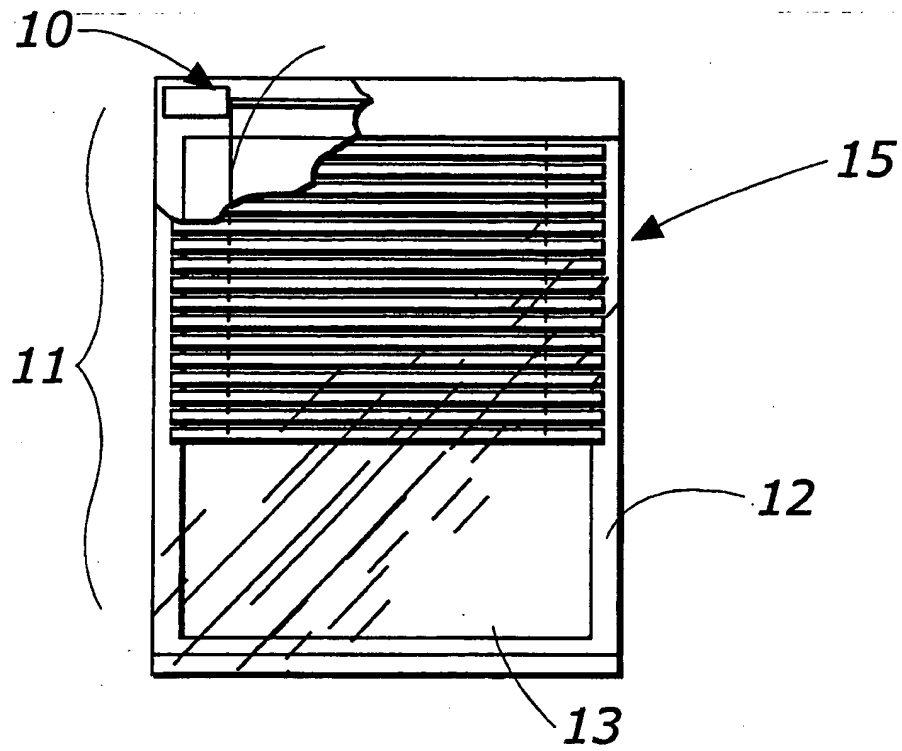


Fig. 1

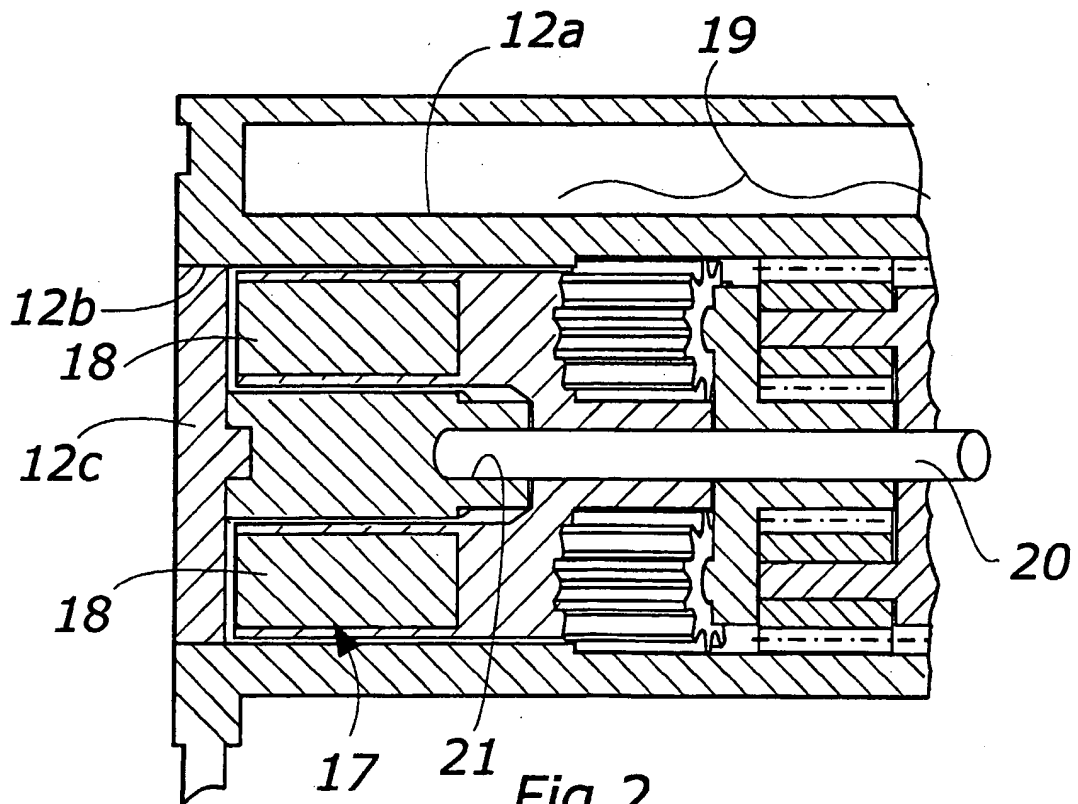


Fig. 2

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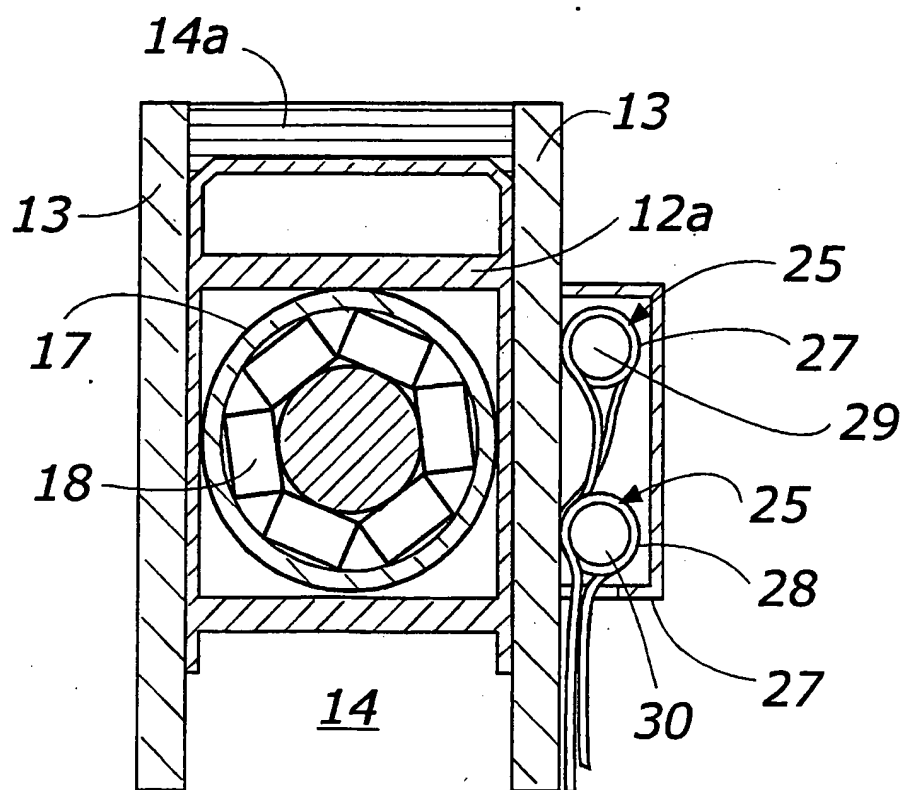
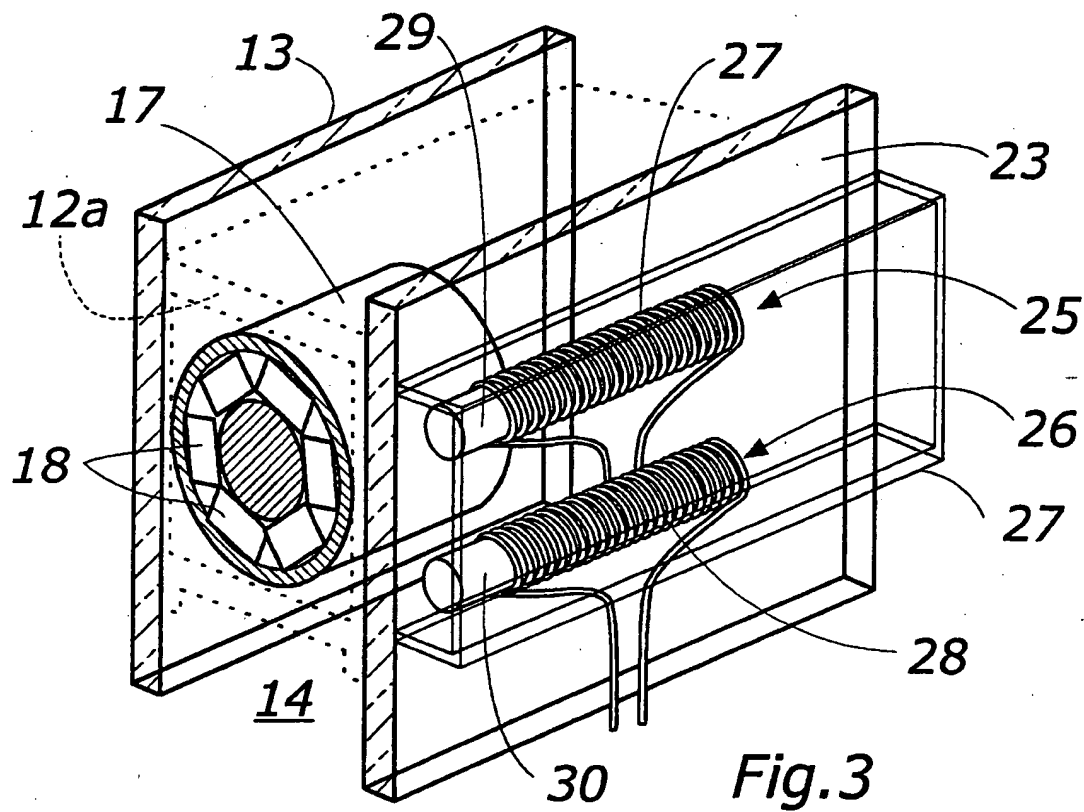
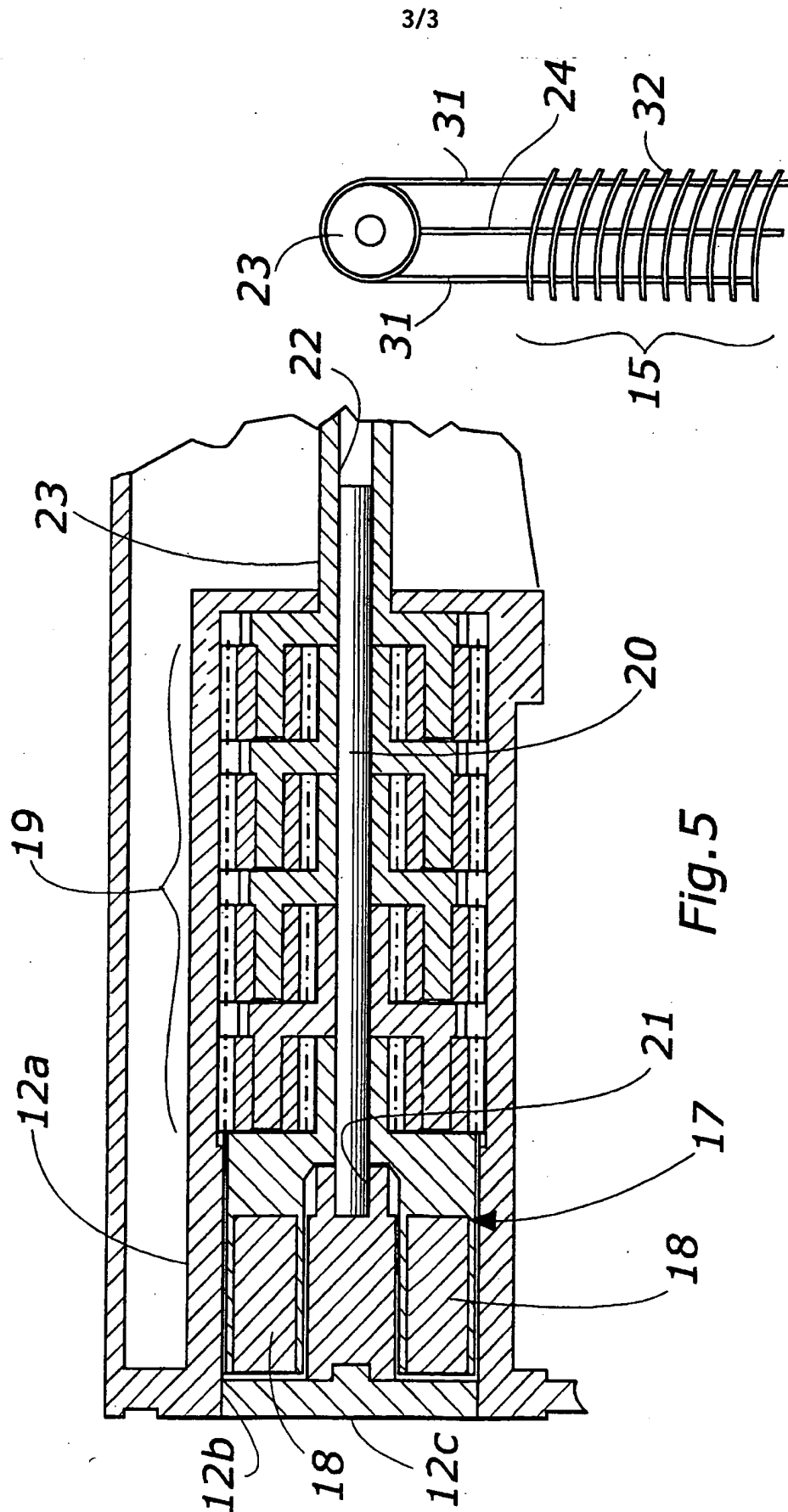


Fig. 4



**Fig. 6**

# INTERNATIONAL SEARCH REPORT

Internat. Application No

PCT/EP 00/09959

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E06B9/264 H02K7/14 H02K5/12 H02K37/12

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E06B H02K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 863 289 A (FINVETRO SRL) 9 September 1998 (1998-09-09) column 4, line 17 - line 23 column 3, line 27 - line 43 figures 1-10	1-13, 16
Y	DE 42 32 395 A (ZIEGLER FRANZ JOSEF DR ING) 31 March 1994 (1994-03-31) column 4, line 5 - line 18 figure 3	1-13, 16
A	EP 0 845 572 A (FINVETRO SRL) 3 June 1998 (1998-06-03) column 3, line 26 - line 30 figure 1	14, 15

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents:

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Date of the actual completion of the international search

26 January 2001

Date of mailing of the international search report

02/02/2001

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

Internat. I Application No

PCT/EP 00/09959

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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